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Swine Influenza Virus (H1 and H3) Seroprevalence on U.S. Swine Operations

Background

Since 1998, two main swine influenza virus hemagglutination types have circulated in the United States—H1 and H3.¹ Viruses of these hemagglutination types can cause respiratory disease within a swine herd and pose a public health threat. Swine can act as a reservoir for influenza viruses that affect humans.²

Swine influenza is often a seasonal disease, usually affecting swine herds between October and March. Acute respiratory signs include a barking cough, nasal discharge, and sneezing.² Occasionally, reproductive problems occur, including abortions and infertility. While this disease has a high morbidity, its mortality rate is low.²

While current vaccine strategies provide some protection, herds are still susceptible to swine influenza because of the multiple subtypes and variants of the virus.³ Due to interspecies transmission and the infectious nature of swine influenza, standard biosecurity measures need to be implemented to help control this disease.²

Swine influenza prevalence on U.S. swine sites

In 2006, the USDA's National Animal Health Monitoring System (NAHMS) conducted a study on swine health and management practices from a random sample of swine production sites in 17 States divided into 4 regions*. These States represented about 94 percent of the U.S. pig inventory and 94 percent of U.S. pork producers with 100 or more pigs. Overall, 2,230 swine

production sites participated in the first interview from July 17 to September 15, 2006.

Producers participating in the NAHMS Swine 2006 study had the opportunity to submit up to 35 blood samples from grower/finisher pigs to be tested for antibodies to H1 and H3 swine influenza viruses. From September 5, 2006, through March 15, 2007, a total of 6,235 samples were collected from 185 swine sites and tested using the IDEXX enzyme linked immunosorbant assay (ELISA) test.

Because the ELISA test does not differentiate between titers due to field virus exposure and titers from swine influenza vaccination, estimates reported here are from unvaccinated grower/finisher pigs only. Of the 6,235 samples tested for swine influenza antibodies, 5,307 were from 158 sites that did not vaccinate grower/finisher pigs for H1 or H3 virus. These 158 sites were used in all subsequent calculations.

Overall, 25.5 percent of samples tested were positive for H1, 26.1 percent were positive for H3, and 38.6 percent were positive for either. In addition, 7.4 percent were suspect for H3.

A site was considered positive if at least one sample tested positive. Overall, 58.2 percent of sites that did not vaccinate for either swine influenza hemagglutination type was positive for H1, 57.6 percent was positive for H3, and 71.5 percent was positive for either.

The percentage of sites with at least one positive sample and the percentage of all samples positive in unvaccinated herds is shown for each hemagglutination type in figure 1.

* Regions/States

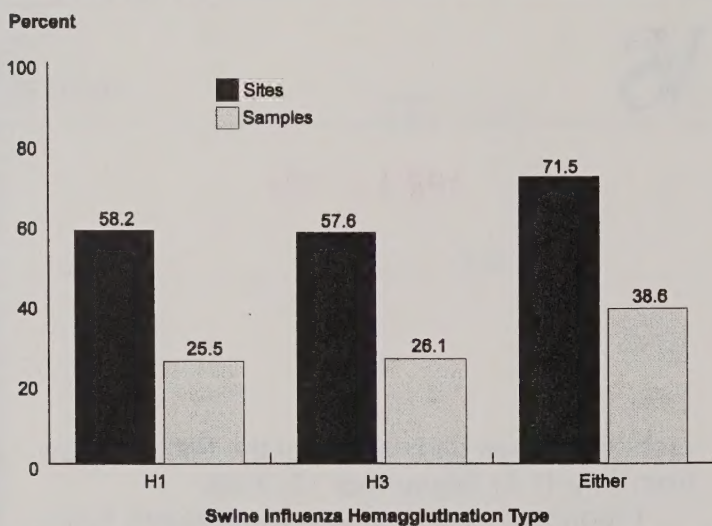
North: Michigan, Minnesota, Pennsylvania, and Wisconsin

West Central: Colorado, Kansas, Missouri, Nebraska, and South Dakota

East Central: Illinois, Indiana, Iowa, and Ohio

South: Arkansas, North Carolina, Oklahoma, and Texas

Figure 1. Percentage of Sites and Percentage of Samples Positive for H1 and H3 Swine Influenza Virus Antibodies in Unvaccinated Herds



Published literature suggests that influenza outbreaks occur more often in the fall and winter.² Table 1 shows the percentage of unvaccinated animals that tested positive for H1, H3, and either strain, by time of year the samples were collected.

An association was observed between the time of year and the presence of antibodies to H1, H3, or either strain. In winter, 30.8 percent of unvaccinated animals were H1 positive compared with 17.5 percent in fall.

Table 1. Percentage of Sites and Percentage of Samples Positive for H1, H3, and Either Serotype, by Season

Hemagglutination Type	Winter ¹		Fall ²		Total	
	Pct. Sites	Pct. Samp.	Pct. Sites	Pct. Samp.	Pct. Sites	Pct. Samp.
H1	65.3	30.8	47.6	17.5	58.2	25.5
H3	62.1	27.7	50.8	23.7	57.6	26.1
Either	76.8	44.1	63.5	30.3	71.5	38.6

¹January, February, and March.

²September, October, November, and December.

For sites that did not vaccinate against flu, the percentage of positive sites is shown in table 2. Over 8 of 10 sites in the East Central region had at least 1 positive sample.

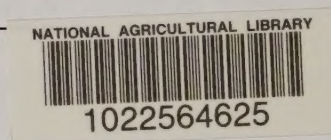
Table 2. Percentage Sites Positive for H1, H3, and Either Strain, by Region

Hemagglutination Type	Percent Sites			
	Region			
	North	West Central	East Central	South
H1	48.7	54.6	66.7	57.1
H3	48.7	50.0	71.4	42.9
Either	62.2	65.9	81.0	71.4

References

- 1 Webby, R.J., K. Rossow, G. Erickson, Y. Sims, and R. Webster. 2004. Multiple lineages of antigenically and genetically diverse influenza-A virus co-circulate in the United States swine population. *Proceedings of the First European Influenza Conference. Virus Res* 103(1-2):67-73.
- 2 Straw, B.E., J.J. Zimmerman, S. D'Allaire, and D.J. Taylor, D.J., eds. 2006. In: *Diseases of Swine*, 9th ed., Iowa State University Press, Ames, IA. p. 201-244.
- 3 Zhou, N.N., D.A. Senne, J.S. Landgraf, et al. 2007. Emergence of H3N2 reassortment influenza A viruses in North American pigs. *Vet Microbiol* 74(1-2):47-58.

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